



DSS-100

Dynamic Sub-Band Synthesizer

Owner's Manual

INSPECTION and INSTALLATION

Your unit was carefully packed at the factory in a carton designed to protect it. Nevertheless, we recommend examining both carton and contents for any signs of damage that may have occurred during shipping. If there is evidence of damage, don't destroy the carton or any of the packing material, and notify your ADC dealer immediately.

In any case it is a good idea to save the carton and packing materials should you ever need to ship your unit in the future.

In addition to a unit and this instruction manual, the carton should contain:

- 1) a set (two pairs) of hookup cables with RCA phono, or pin, plugs;
- 2) a warranty/registration card.

No special cooling or ventilation is required in any installation; other components may be stacked above or below the unit provided that they themselves do not generate excessive heat.



CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN



CAUTION

TO REDUCE THE RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER, BACK OR BOTTOM.
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



This symbol is intended to alert you of the presence of unmarked dangerous voltage within the unit's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



This symbol is intended to alert you of the presence of important operating and maintenance instructions in the literature accompanying the unit.

WARNING

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS COMPONENT TO RAIN OR MOISTURE.

For customers in the U.K. – Important for your safety

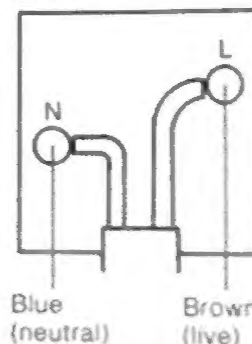
The wires in this mains lead are coloured in accordance with the following code:

Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured blue must be connected to the terminal which is marked by the letter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

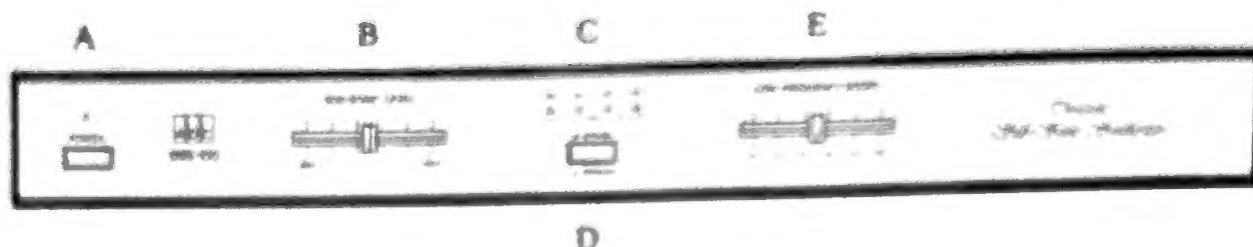
Warning: Do not connect any wire to the larger pin marked E or  when wiring a plug. Ensure that all terminals are securely tightened and that no loose strands of wire exist.



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FRONT PANEL



A POWER. This button turns the unit on and off.

B SUB-SONIC LEVEL. This slider controls the amount of synthesized bass that the DSS-100 adds to the program. Its effect depends not only on where it is set between MINimum and MAXimum but also on how much bass is present in the original signal to be augmented. It works independently of the LOW FREQUENCY BOOST slider.

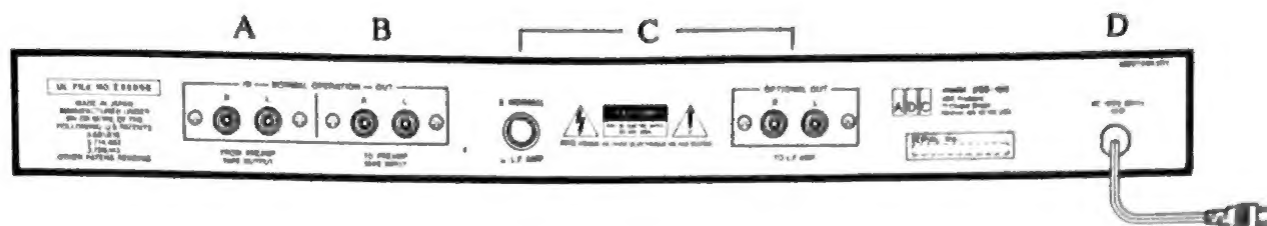
C LED row: 28, 34, 40, 50 Hz. These light-emitting diodes (LEDs) light up whenever the DSS-100 is synthesizing bass subharmonics, and they get brighter according to the setting of the SUB-SONIC LEVEL slider and according to the amount of bass being synthesized (which depends on that in the incoming program material). The number above the LEDs are the centers of the bass frequencies being generated by the DSS-100 - and are exactly half the frequencies of the incoming, original program's signals.

D BYPASS/OPERATE button. This switches the DSS-100 sub-sonic-synthesizing action into and out of operation, enabling comparisons. Left out, at BYPASS, the button removes the DSS-100 sub-sonic synthesis and the incoming program is not augmented in the bass. (The LOW FREQUENCY BOOST slider, described below, still affects the program, however.) When the

button is in, to OPERATE, new bass harmonics are synthesized, depending on the program material.

E LOW FREQUENCY BOOST. This slider boosts the bass on each channel, but its action is somewhat different from and gentler than that of most bass tone controls. In the 150 and the 30 Hz areas it's much less strong, and even at its own boost peak, in the 50 - 60 Hz area, it is less potentially damaging and boomy than the typical bass control. Thus it might be said to fill in the "gap" between the very low bass (below 55 Hz) the DSS-100 creates and the mid-bass of the original program, smoothly and effectively evening out the total apparent bass response. This slider's action is independent of the SUB-SONIC LEVEL control; they have little effect on each other. LOW FREQUENCY BOOST may be used by itself, as an all-purpose bass control, although it cannot lessen bass and, as noted, the shape of its curve is different. Be cautious about pushing it all the way right to the 8-10 area, especially if you are using any other bass tone control (not advised), speaker equalizer (see "Typical Hookups"), and/or if the SUB-SONIC LEVEL slider is to the right of its midpoint too.

REAR JACKS and CONNECTIONS



A NORMAL OPERATION:

FROM PREAMP TAPE OUTPUT.

Connect the "Tape Out"* jacks of your preamp** to these DSS-100 inputs, left to left and right to right. (Right commonly is designated by red cable ends; for some people it helps to remember that the words "right" and "red" start with the same letter.)

B NORMAL OPERATION:

TO PREAMP TAPE INPUT. Return the signal from these DSS-100 outputs to the "Tape IN"*** jacks on your preamp.

C NORMAL/L.F. AMP button, and

OPTIONAL OUT: TO L.F. AMP jacks.

Pushing this button in (to L.F. AMP) causes the original program signal, without any bass augmentation, to go to the TO PREAMP TAPE INPUT jacks. The augmented bass only, as controlled by the LOW FREQUENCY BOOST and SUB-SONIC LEVEL sliders, appears at these OPTIONAL OUT TO L.F. AMP jacks. Note that the original full-range information (normal bass and all) going to the TO PREAMP TAPE IN jacks is not affected by the front-panel sliders.

The DSS-100 is not a crossover, but if you have a separate subwoofer and amp and lack a crossover network, you can use this button and these jacks to distribute the program signal and create special bass effects (use them only for this purpose). Connect these jacks to the input jacks on the subwoofer amplifier.

However, if you have one of the more common situations, place the DSS-100 as described above for the NORMAL OPERATION jacks, in the preamp's tape-monitor loop, and leave the crossover

connections and/or speaker connections as they are usually. The two most typical, perhaps, have an active out-board crossover to separate the mid/high frequencies from the low ones in feeding your main speakers and a subwoofer, or have the crossover contained inside the subwoofer system such that your power-amp speaker cables are connected to the subwoofer inputs, with terminals provided at the subwoofer for hooking up the mid/high frequency units.

See the "Typical Hookups" section for further discussion of the pros and cons of using the DSS-100 in various configurations with subwoofer systems.

D POWER CORD. Connect this cable to the appropriate source; the correct information is printed on the unit's rear panel next to the cable's entry hole. (USA/Canada, AC 120 V, 60 Hz.) The unit may be damaged if it's not connected to the proper power source. If your unit has a switch for different power sources, be sure it is set correctly.

*Also called TAPE REC, TO TAPE REC, TO TAPE IN(PUTS), (OUT) TO TAPE, TAPE OUTPUT, etc.; there probably are others.

**For simplicity's sake, "preamp" will mean preamp, receiver, or integrated amp — or the tape-monitor loop of an equalizer, reverb unit, or other component.

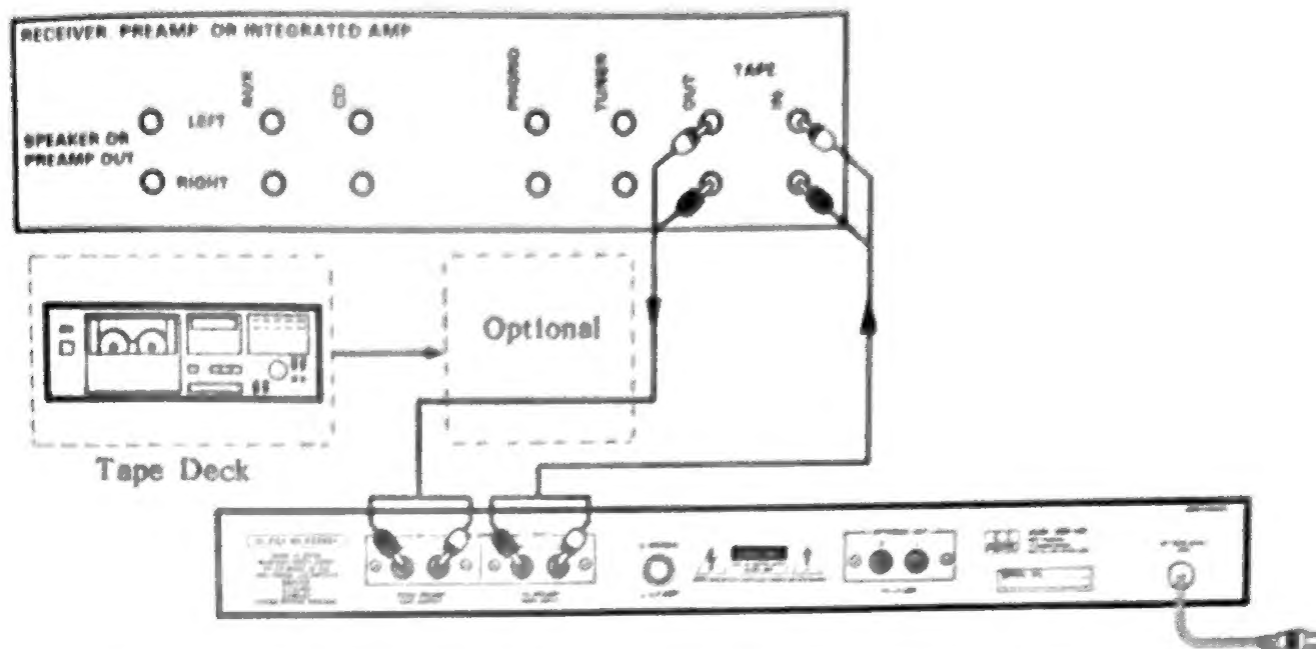
***Also called PLAY, TAPE PLAY, PLAYBACK, (IN) FROM TAPE, FROM TAPE OUT(PUTS) etc.; others here too, probably.

INTRODUCTION TO SUB-SONIC SYNTHESIS

Many of the components in your hi-fi system may be specified as having flat frequency response from 20 Hz to 20 kHz, beyond the limits of hearing for most people. Your electronic equipment (preamp, amp, radio) probably meets this within a decibel (dB) or two, your phono cartridge within two or three, your tape deck (at low recording levels) within a few more. Your loudspeakers, however, even if they are accurate to begin with and properly placed in your room, more than likely roll off in response below the 50 - 60 Hz region. Furthermore, even at loud listening levels the ear is not nearly as sensitive to low frequencies as it is to high ones, and this insensitivity increases at softer levels. If a 3 kHz sound (the frequency where the ear is most sensitive) is at 95 dB SPL (loud orchestral music), a 50 Hz tone has to be at about 115 dB SPL to sound equally loud, a difference of some 20 dB. At lower levels, the difference is greater. A 3 kHz sound at 60 dB SPL (quiet chamber music) is equaled in loudness by a 50 Hz tone at 85 dB SPL, a difference of 25 dB. So to maintain the proper listening balance at the softer level in just this concert-hall range, 50 Hz would have to be boosted fully 5 dB (30 Hz would have to be boosted about 8 dB to maintain the balance). At levels lower than 60 dB (which are common in the home), the relative differences are greater.

Therefore the DSS-100 will prove useful for listening at all levels below the very loudest in the home. (At loud levels, not only is the DSS-100 not needed, except perhaps for a little lowest-octave restoration through sub-sonic synthesis, but using its full capabilities could harm your loudspeakers.) It performs a different kind of loudness compensation: it restores what isn't there in the first place, and it increases to the proper levels those sounds the ear begins to miss in moderate and quiet listening.

TYPICAL HOOKUPS



Using the DSS-100 with components with only one tape-monitor loop

The preamp's "Tape Out" jacks ("To Tape Rec", etc.) go to the FROM PREAMP TAPE OUTPUT jacks on the DSS-100. If you have a tape deck, it goes here, between the preamp and the DSS-100, as shown, with the preamp's "Tape Out" (or whatever) going to the deck's inputs (sometimes "Rec") and the deck's outputs ("Play", etc.) going on to the DSS-100's FROM PREAMP TAPE OUTPUT. Red plug means right channel.

With or without a tape deck, the signal returns to the preamp's "Tape In" ("From Tape," etc.) from the DSS-100's TO PREAMP TAPE INPUT jacks.

To use the DSS-100 in playing records or listening to the radio in this setup, select "Tape Monitor" on your preamp and, if you have a tape deck, put it in "Source". Be sure that the recording-level and output-level controls (if any) on the deck are at their normal positions, not all the way down. To use the DSS-100 in playing tapes, operate your deck normally, as you usually do. Note that the deck must be on whenever you wish to use the DSS-100.

Similar situations

If you have two tape-monitor loops and only one tape deck, it's best to put the deck in the first loop and the DSS-100 in the second, to eliminate the possibility of accidentally taping the boost and/or synthesis contributions of the DSS-100 onto a recording. (Should you ever wish to do such tape recording, use caution, for the tape deck will be easily overloaded by the DSS-100.)

Although obviously we advise locating the DSS-100 in a tape-monitor loop (or similar, "external-processor" loop), it can be placed between preamp and power amp if all such loops are occupied, or it can go between your receiver/integrated amp's "Preamp Out"/"Main Out" and "Main In". (But first see the other "Typical Hookups".) If you do either of these, extra care in turning on and off the power amp and DSS-100 is called for, to prevent low-frequency transients and/or other noise from harming speakers. Always turn the DSS-100 on before the power amp, and always turn the power amp off before the DSS-100.

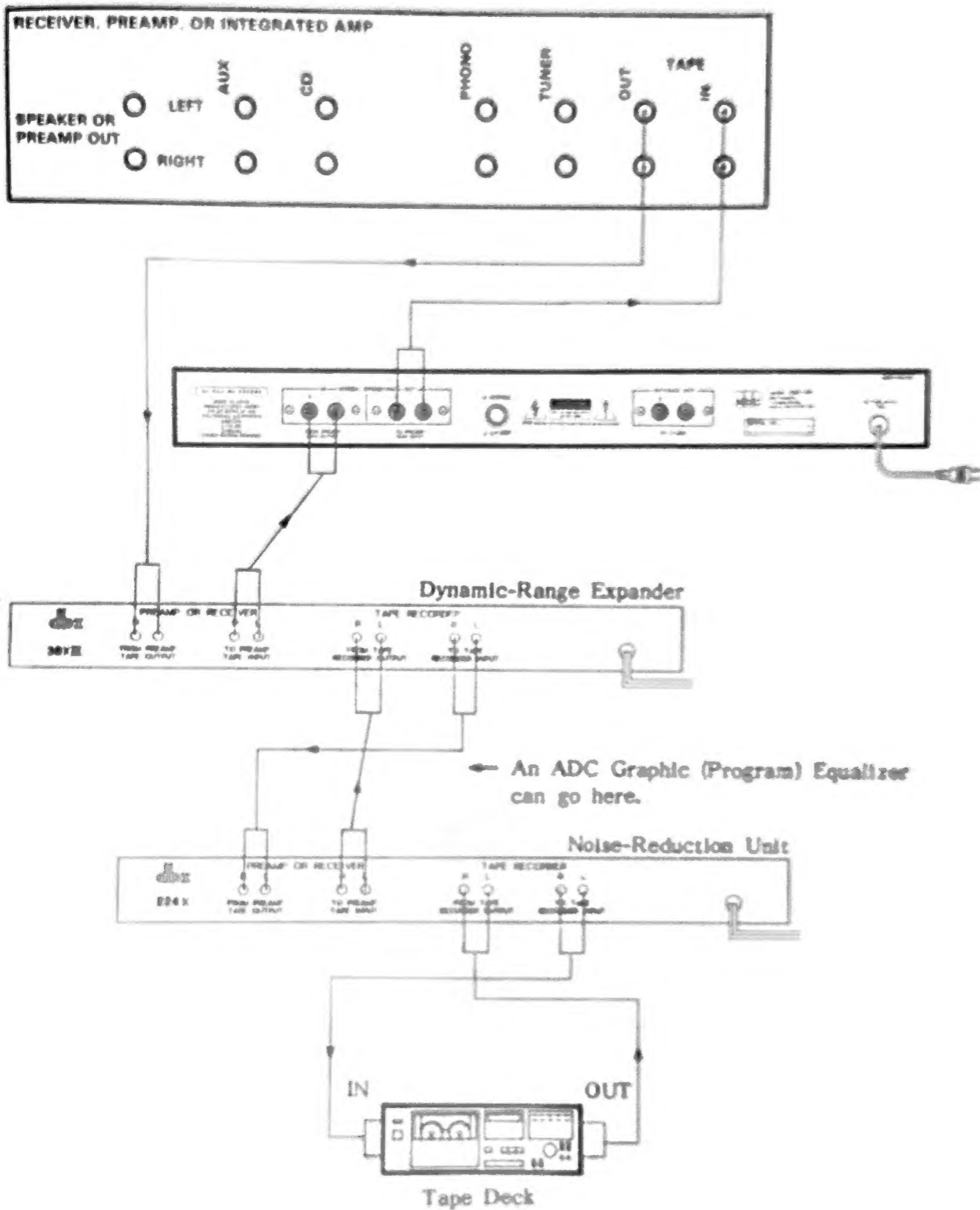
Using the DSS-100 in a complex system (one with other signal processors)

Generally, place the DSS-100 last in a chain, with its TO PREAMP TAPE INPUT returning the signal to the preamp's "Tape In" ("From Tape", etc.), having received the signal through its FROM PREAMP TAPE OUTPUT jacks from the processor just before it. This processor can be a dynamic-range expander, a graphic (program) equalizer, or a noise-reduction unit such as the dbx 224X. The order shown here is the one we recommend as most quiet and flexible. It is essential to keep the signal path between noise-reduction unit and tape deck direct and clear, so as not to create mistracking of the encode/decode process. Red plug means right channel.

For processors with "Pre" and "Post" switching, it does not matter which is chosen, except that tape decks making recordings can be easily overloaded by too much expansion and/or frequency-band boosting beforehand ("Pre"), and there can be no "Pre" settings if dbx discs are to be played back properly, through a dbx noise-reduction unit.

Two sound-processor categories that should come after the DSS-100 the DSS-100 in the chain, as shown, are speaker-only equalizers and automatic equalizers like the dbx 10/20. These should have the "last word" on the sound, even after the DSS-100's bass augmentation. However, note that most speaker-only equalizers (e.g., those made by Allison, dbx, Bose, EV, McIntosh, et al.) have large bass boosts themselves — which means extreme caution is warranted when using them with the DSS-100.

For those whose music systems are as complicated as or more complicated than this, dbx makes the model 200X and 400X Program Route Selectors, which, though only one tape-monitor loop, permit the hookup of several sound processors, tape decks, and a noise-reduction unit. They might be worth your investigation.



Using the DSS-100 with a subwoofer system

As was pointed out in the "Rear Jacks and Connections" section, the DSS-100 does not contain a crossover network, and the ideal way to use it with a subwoofer system is to send the full-range signal with the DSS-100's augmented-bass contributions from the preamp output to the inputs of the subwoofer crossover network. The crossover splits the signal, giving the low frequencies to the subwoofer system and the higher frequencies to the mid-range/high-frequency speakers (and their respective amplifiers, if they are separate). The advantage is that this dividing lightens the low-frequency load on the mid-range/high-frequency units (and their amp); only the subwoofer gets the bass.

If the DSS-100 is used to feed the subwoofer system, however, nobody's load gets lightened. Several other points are worth making, too. Depending on the LOW FREQUENCY BOOST settings, the L.F. AMP jacks used to supply signal to the subwoofer may be sending information as high as 150 - 175 Hz, which few subwoofers are supposed to reproduce. (No harm will be done to the subwoofer system by using the DSS-100 in this fashion, and, as mentioned earlier, such a setup may well produce pleasing effects, but not the most natural sound. It might be worth trying the L.F. AMP jacks with an old spare power amp and leftover speaker, if you have them, for special situations where you simply want a lot of extra bass.) Also note that if the LOW FREQUENCY BOOST slider is down and the SUB-SONIC LEVEL slider is up, the subwoofer system will get mostly the synthesized signals, from 55 Hz on down.

The technically minded who pursue this L.F. AMP application will want to know several things about the optional outputs. They are mono, the stereo original input having been combined (the ear's directional abilities are considerably diminished at the lowest frequencies). The LOW FREQUENCY BOOST slider at MAXimum produces a boost at 50 Hz of around 6 dB above the normal outputs. The boost starts rising above the regular program level at about 150 Hz and is up 3 - 4 dB at 100 Hz and also at 30 Hz. Above and below these points it rolls off, 3 dB or so for the first octave and 6 dB thereafter above 100 Hz or so, and much more steeply below 30 Hz, thanks to a sharp filter. So the shape of this slider's curve shows that the lowest frequencies, below its high point of 50Hz, aren't boosted much - a subwoofer receiving the L.F. AMP output is the region where the synthesized signals, at half the frequency of the input, are generated. These get increased hardly at all by the LOW FREQUENCY BOOST slider at any setting; it acts on the original bass only (remember that these two sliders are independent).

The newly generated frequencies below 55 Hz do get boosted by their own, SUB-SONIC LEVEL slider, naturally. They are at equal strength relative to the original (above 55 Hz) input at slider midpoint, and up to 8 - 9 dB stronger with the slider at MAXimum. Clearly, the combined contribution of these two sliders can be very potent, even with the SUB-SONIC LEVEL slider set just in the middle and the LOW FREQUENCY BOOST slider in its upper half. (Its action is considerably gentler over its lower half.) And then, in this L.F. AMP application, there still will be the acoustical contribution of your regular speakers below 100 Hz (whatever they are capable of, which likely will be of consequence). So start with each DSS-100 slider at perhaps one-third up and listen for its effects (not playing bass-shy material) while pushing both slowly to the right. Different kinds of musical program, of course, will call for different combinations of settings (see "Notes on Use").

NOTES ON USE

Begin by setting the preamp's bass control to flat (usually at 12 o'clock position) and seeing that any "loudness contour"/low-level bass-boost button or knob is likewise out of the signal path. Later on you can resume using these controls (in moderation), as you become familiar with how they differ from the DSS-100's controls and what combinations of settings are useful. Boosting everything now at the start will send things into distortion, especially your speakers.

Then pull out some of your favorite records (but not ones that are bass-shy). If your taste runs to popular music, especially rock, start by setting the SUB-SONIC LEVEL slider at its midpoint and vary the LOW FREQUENCY BOOST slider from 1/3 to nearly full right. Be careful, again, not to push it right recklessly and/or at loud listening levels. After you find a BOOST level that thumps as hard as you like, experiment with the SUB-SONIC LEVEL slider for satisfying levels of "felt" bass. You may find that the rock cuts you like best take on a whole new life.

Similarly jazz, especially walking bass and big-band blowouts with swing drumming. Like pop and rock, these often loud and exciting recordings may have been compressed and had their deep bass filtered out. The DSS-100 will help fix this by putting some of the sock back into them.

With classical music, a lighter hand is called for, especially with the SUB-SONIC LEVEL slider. The growl of organ pedal and the "oomph" of full-orchestra attacks can berought up even at the midpoint setting and down. Some piano repertory likewise can have lower-frequency textures extended and pleasingly thickened, notably the larger 19th-century Romantic works, which have considerable impact when

heard live. (The same goes for the symphonies of the period.) But excessive bass augmentation and boost will make some classical instruments boomy and will make voices unnatural-sounding, while string and vocal music doesn't have much bass to offer the DSS-100 in the first place.

Despite these guidelines, we urge you to experiment, since musical sound in the home is so much a matter of taste. You may wish to mark tentative settings of the DSS-100 on your most exciting records and tapes to refer to for future playings.

EXPERIMENTATION AND POSSIBLE PROBLEMS

Phasing

Since you are going to be increasing the bass response of your music system, it is a good time to recheck your speaker wiring to ensure that the loudspeakers are moving in phase with each other. When they are in phase, their cones move together, forward or backward, at the same time. For full details refer to the speaker's instruction manual. Briefly, the way to check phasing is to ascertain that the two speakers are hooked up identically, from the power amp's output connections through the two sides of each speaker wire (cable) to the input terminals on the back of the speaker. It doesn't particularly matter how one side (either right or left) is done, but the other channel must be exactly the same. While you are doing rewiring, you might want to replace any flimsy or thin speaker wire with heavier "lamp" or "zip" cord, available at most hardware stores, no. 16 gauge or lower.

By the way, all speaker wires have one conductor side coded to make proper hookups easier. Usually this side has a thin ridge running the length of the wire; sometimes the wire itself is

different colors, one side silver and the other copper.

Loudspeaker placement and listener positions

Generally, the way to change the sound in your room most markedly is by repositioning the speakers; this often has an even greater effect than buying new ones. Now might be the time to experiment in this area too. Most listeners come to realize that speakers apparently produce more bass near wall or wall/floor intersections than far from them. But this increase comes from uneven, boomy bass. Research over the last decade has shown that it is possible to get smooth and even bass. The rule (unless the speaker manufacturer specifically advises otherwise) is to place speakers so that the three distances from the center of the woofer to the nearest boundaries (walls and floor, usually) are as different as possible.^{*} These distances are measured along the speaker-cabinet sides, not in a straight line. When these distances are the same, the bass response of most speakers is roughest, with peaks and dips more than 10 dB apart over just a few notes. Putting a conventionally box-shaped speaker woofer-down in a corner will make it sound very bassy at first (and a few of the low notes are being strongly emphasized), but for evenness of bass it's the worst spot possible, because the distances from woofer center to boundaries are all the same.

The same acoustical laws apply to your listening position: the flattest bass will result when the distances from your head to the nearest boundaries are as different as possible.

Balances

If you do wind up relocating your speakers, it might be desirable to reset the output-level controls on the back of the cabinet for tweeters and mid-ranges. Many speakers are flat-test with these controls all the way up, and the new increase in bass might be better-balanced by such a maximum setting.

Feedback

Finally, any or all of these improvements in bass may well make your record player more susceptible to feedback, wherein the turntable base, platter, cartridge/stylus, and/or the disc itself actually pick up and replay bass from the speakers. One symptom is an increasing, flapping rumble as you turn the volume up (more severely, the system begins to howl) that disappears or is markedly reduced when the tonearm is lifted off the record. The cure is to isolate the turntable, making it immune to low-frequency vibrations (including foot-steps).

The first step is to locate the turntable as far from the speakers as is practical (or vice versa). Next — short of replacing it, since some turntables are much more prone to feedback than others — is to place some vibration — damping material under the base. This can be dense foam, supermarket sponges, or special shock-absorber feet designed for just this problem. A massive base or table under the turntable may "decouple" it from the speakers, too. (Anything that achieves this decoupling probably is advisable.) Severe cases, e.g., a springy floor that transmits bass from speaker back to record player irrespective of how cushioned the latter is, may be addressed by putting up a wall-mounted shelf for the turntable.

^{*} The reason for this is that rooms in houses are almost always small (acoustically) in terms of bass wavelengths (measurable in feet). Such rooms cannot distribute bass very smoothly. It bounces around, reflecting off walls and floor (or it "leaks out" through the flexing of walls and floors that aren't stiff). The worst bouncing around occurs when the three woofer-to-nearest-boundary distances (A, B, C) are the same ($A=B=C$), which makes the reflections of a given frequency all return at the same time. This causes a large peak (reinforcement) or a dip (cancellation). When these bass reflections have different distances to travel they come at different times, and are smoother to hear. The formula for maximally different distances and least-bumpy speaker placement is $A/B=B/C$, or $B^2=A \times C$, when A, B, and C are not the

CAUTIONS

Levels

Very low bass calls for considerable amplifier power and for loudspeakers that can take this considerable power. The DSS-100, as we have said, not only can boost the bass that is present in the original program but can generate sizable amounts of new bass at even lower frequencies. And it can do both of these things at once. Therefore, be wary of using the DSS-100 at its extreme settings at any kind of loud volume level. When installing the DSS-100 furthermore, turn down the volume control(s) before you turn your stereo back on. Be sure to do this, for woofers can be readily damaged by very low, loud bass.

If cracking, popping, or buzzing sounds are heard (even at relatively high frequencies), lower the volume right away and decrease the LOW FREQUENCY BOOST and/or SUB-SONIC LEVEL settings.

Carrying ability

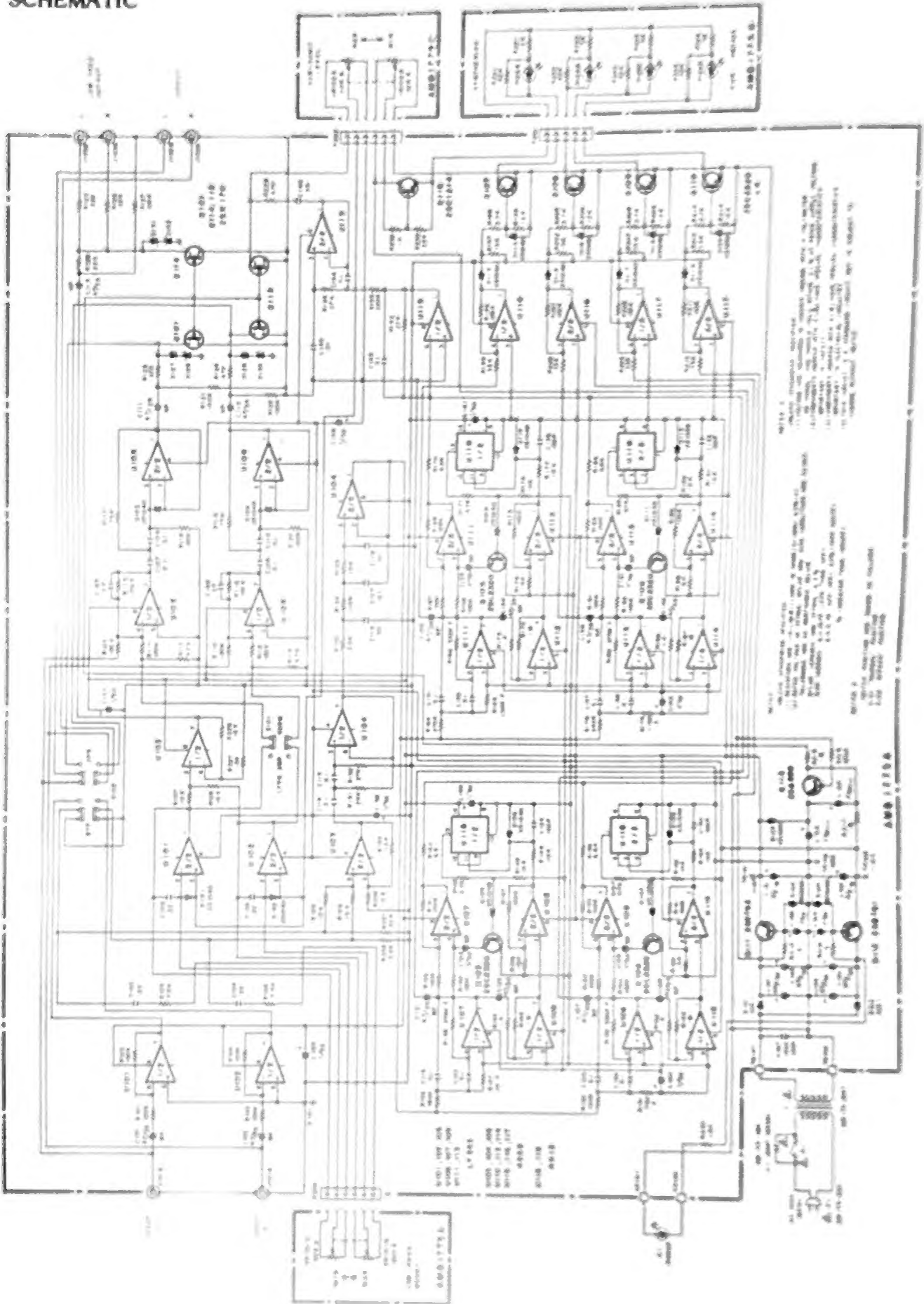
Low frequencies carry well, much better than higher ones. Perhaps your neighbors are aware of this fact. If you boost and/or produce bass with your DSS-100, especially while playing pop music loudly, the effects of the DSS-100 will be that much more audible outside of your listening area. You will want to be alert to these changes, too.

Avoiding transients

Any sharp noises from your sound system — turn-on thumps, switching pops, tuner bursts, record ticks, dropped tonearms — are hard on your speakers, and since the DSS-1 amplifies and augments all low-frequency information, extra caution is called for at all times. To be safer, turn the power amp on last and off first, and always keep the main volume con-

trol low or off when turning the system on, too. Also use the preamp's muting switch, if it has one. This might be a good time to clean (or have cleaned) all switches, buttons and knobs on your equipment if any rasp or crackle, and to check that the turntable cueing is gentle. ADC cannot take any responsibility for any damage to amplifier, loudspeakers, or other hi-fi components that results from using the DSS-100.

SCHEMATIC



SPECIFICATIONS

Input Impedance.....	50k-ohms
Maximum input level	TV
Output Impedance	440 ohms; designed to drive 5k-ohms or higher
Maximum output level	6.5V into 5k-ohms
Frequency response (main signal channel)	+/- 1dB, 25-20kHz
Synthesis frequency range	27-55 Hz (from 55-110Hz input signal)
Total harmonic distortion (main signal channel)	0.05% (30-20kHz)
Hum and noise (main signal channel)	-83dBV, A-weighted, no signal, controls @ maximum
Dimensions	1-22/32"H x 17-5/16"W x 7-3/32"D
Power requirements	see rear panel of the unit

Specifications subject to change without notice or obligation

Limited 1-year warranty

ADC warrants this product to be free from defective material and workmanship for a period of one (1) year from original date of purchase. ADC agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit, except stylus (needle) record or battery, whichever is applicable, free of charge for parts and labor, provided unit is delivered by the owner or representative to one of our authorized service agencies with proof of purchase intact for our examination.

- 1 Present your unit to an authorized service agency with proof of purchase.
- 2 Merchandise must be packed carefully in original packing.
- 3 All merchandise must be prepaid to ADC and will be returned freight paid.

For Return Authorization, write to: ADC, 71 Chapel Street, Newton, MA 02195. This warranty does not extend to any of our products which have been subject to misuse, neglect, accident, incorrect wiring not our own, or to use in violation of operating instructions furnished by us, nor extend to any units altered or repaired for warranty defect by anyone other than an authorized service agency.

This warranty does not cover any incidental or consequential damages and is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Some states do not allow limitations on how long an implied warranty lasts, and/or exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific rights and you may also have other rights, which vary from state to state.

Above warranty covers U.S. market only. Other areas see separate enclosed warranty.

ADC ADC Products
71 Chapel Street
Newton, MA 02195 USA